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Reading is a highly individualized matter, and each child differs from every other in his ability to read. The understanding teacher of any group of children recognizes the wide differences in reading ability and works to help each child succeed in terms of his capacity.

One of the most widely used methods of teaching reading involves dividing the class into three groups based on ability. This plan, however, often negatively affects the children, especially those in the "poor" group. Some teachers divide their classes into five or more groups. In these situations the groups are organized, not on the basis of ability, but on the basis of a purpose, a problem, or a specific need. Such a method keeps the groups flexible rather than fixed.

Teachers interested in an even more personalized method are moving from use of many small groups to an individualized reading program. Children being taught by this method are encouraged to select books from their school or classroom library. They will generally reject books that are too hard, too easy, or lacking in appeal. The program also includes reading quietly as individuals, reading to each other, listening to a story, or reading poetry aloud. The individualized method should not preclude all the shared group and class reading experiences.

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Programmed Learning

A Back Door to Empiricism in English Studies

KENNETH S. ROTHWELL

Probably very few people would be willing to acknowledge any relationship between *Teaching Machines and Programmed Learning*, edited by A. A. Lumsdaine and R. Glaser (N.E.A., 1960), and Professor Northrop Frye's *Anatomy of Criticism* (Princeton, 1957). The two titles look like archetypes for the "educationalist" and the "scholarly" mentality, as far removed from each other in space and time as Earth and the outermost galaxy. That a case should be made for their complementary rather than antithetical relationship would seem at best foolish and at worst lunatic. A book on "teaching machines" apparently has relevance to mundane problems in the teaching of elementary English, while Professor Frye's study seems applicable only to the rarified atmosphere of the seminar room. The time is at hand, however, to recognize that these two books suggest a blueprint for placing English studies on an empirical basis. What has happened is that the methodology of the "educator" and the literary critic have suddenly ceased to be at odds. If this is so, then the whole pattern of English studies requires inspection from this new perspective.

Teaching Machines and Programmed Learning collects under one cover authoritative essays on automated teaching, a subject which has lately received much attention in both the popular press and the learned journals.[1] As these essays show a "teaching machine" is simply a mechanical tutor which allows students to work at their own pace through a set of increasingly difficult questions. In combining "the Socratic method of teaching by asking questions and the Cartesian method of analyzing a problem into its smallest parts and proceeding from the simple to the complex,"[2] a well-programmed machine accomplishes what every good teacher has always struggled for. Furthermore the machine will not permit a student to proceed to the next question until he has answered the previous one. A machine with the strength to block the advancement of a student incapable of mastering, for example, parallelism could prove the greatest boon to teachers of composition since the invention of the red pencil. Although no one knows how much the mere novelty

Mr. Rothwell, an assistant professor at the University of Kansas, states, "I agree with Harold C. Martin that English faculties should give 'a tenth of their time' to 'the work of the schools.'"

[1] Cf. F. Rand Morton, "The Teaching Machine and the Teaching of Languages: A Report on Tomorrow," *PMLA*, LXXV (Sept. 1960), 1-6; "Programed [sic] Learning," *Time* (March 24, 1961), 36-38; D.A. Cook, "Programmed Learning: A Revolution in Instruction," *Graduate Faculties Newsletter* (Columbia University, 1960), 1-2.

[2] John W. Blyth, "Teaching Machines and Human Beings" in Lumsdaine and Glaser, p. 406.

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of the machine has influenced early results, experimental work at Harvard by Professor B. F. Skinner, a psychologist who has played a leading role in this field, indicates that students can master material more rapidly and profoundly on a machine than in an ordinary classroom situation. The full implications of teaching machines and programmed learning to the teaching of English composition and literature have not so far as I know been completely thought through.

In contrast, Professor Frye's *Anatomy of Criticism* is an analysis of the "scope, theory, principles, and techniques of literary criticism." Professor Frye, commenting at one point that literary criticism is a *de facto* science, shows that there is in literary studies a "total coherence," a grand design which cuts across all the quarreling schools of modern critics. He demonstrates that the inductive study of literary forms—precisely as though they were "objects"—can lead to important insights into the nature of literature. He suggests that criticism should become to the order of art, what physics is to the order of nature. He even goes so far as to say that a scholarly discipline which cannot present its basic principles to an intelligent teen-ager is in bad shape. What Professor Frye actually demonstrates—with remarkable brilliance—are the limits, goals, and essentials of literary criticism. So far as I know no one has thought much about the implications of a theory of "total coherence" to the teaching of elementary courses in composition and literature.

Leaving aside Professor Frye's book for the moment, let us examine some of the possibilities and limitations of machine teaching and programmed learning in the teaching of composition. First of all, "programming"—the construction of sequenced questions which lead a student by "step-increments" into increasingly difficult concepts—is of far greater importance than the teaching machine. As all experimenters have agreed, the chief value of the machine lies in its capacity to impose a discipline upon the programmer, a fact which even suggests that programs can dwell independently of machines. For this reason the Orwellian nightmare of an automated classroom with buzzing lights and punched IBM cards need not haunt the minds of traditionalists. No amount of gadgetry will ever substitute for an intelligent program, painstakingly prepared by teachers steeped in their subject matter. The challenge of the machine lies simply in its demand on the profession to establish methods and aims with sufficient clarity to allow construction of a program.

How much or how little of English studies can effectively be programmed remains a question which only experimentation can answer, though the likelihood is that wide-scale studies may open up more possibilities than anyone can now envision. Clearly the mechanics of composition, involving simple matters of right or wrong, can now be arranged for machine teaching. Already in print is Joseph Blumenthal's *English 2600* (Harcourt, Brace, 1960), which offers 69 lessons on the sentence, modifiers, verbs, pronouns, capitalization, and punctuation; each lesson in turn is broken down into 30 or 40 steps, or "frames," designed to provide the kind of "reinforcement" which will engage the student's attention. The effectiveness of *English 2600* can only be tested by trying it out on several thousand students. Parenthetically it should be noted that Mr. Blumenthal has elected to use the "linear" method of Professor Skinner, which places stress on mastery of successively more difficult questions by offering a student a choice between a right and a wrong answer or requiring him to fill in a blank space. A rival "back-wash" or "branching" method, devised by Norman Crowder, allows the student a multiple choice, which in turn sends him

back and forth through a specially designed "scrambled" textbook.

Whether the programmer selects the "linear" or "back-wash" method, or whether he adapts the program to a machine or a textbook, may not be of major consequence. The important thing is that students can proceed at their own pace. A rapid learner—having mastered 10 to 20 to 60 or 100 frames showing exactly what a subject is, what a verb is, what a participle is, what a gerund is, or what a dependent clause is—moves on to materials requiring the services of a live teacher. The slow student, who bogs down on frame 50 or frame 65 or frame 100, can be sent back through the sequence all over again; or, even better, he can be supplied with an alternate slow learner's program which will break the whole process down into even smaller steps. Thus the student who cannot master in 100 frames the principle of agreement between subject and verb can be treated to the same concept by means of 500 frames. If by then he still has not grasped the point, perhaps he should give serious consideration to a non-literary career. Virtually all remedial English at the college level could be handled by automation, with the machine as an impartial judge of a student's ability to move ahead. Teachers, relieved of the executioner's role, could then become counselors rather than taskmasters. Their human talents, at a time when trained talent is scarce, could be salvaged for situations better suited to them than mere drill.

The applicability of programming and machine teaching in problems beyond the level of simple mechanics remains an unexplored area. The rhetorics of ancient masters like Quintilian and Renaissance teachers like Wilson, Puttenham, and Peacham serve notice, however, that "programming" is of ancient vintage. The prose tracts of John Milton reflect merciless drilling in boyhood on the principles of balance, antithesis, and periodicity. His teachers at St. Paul's School might have welcomed a mechanical aide less inhuman than a birch for placing this work on a methodical basis. Now by means of a machine the vista, or spectre, opens up of forcing students into the kind of close analysis of a text which the profession is forever talking about but rarely achieves. With a poem or essay on the wall above the machine, the student can be forced by a programmed sequence of questions to wring the text dry. In classroom situations two or three students usually carry most of the discussion about a text; the machine would require every student to go through the same intellectual process. The student could be made to identify over and over again the five basic sentence patterns. He could be bullied into inspecting various combinations of sentences for their looseness, their antithetical parallelism, their complementary parallelism, and so forth. He could be made to grasp the controlling organization of a paragraph, the design of an essay, and the merit or demerit of a definition. A complete program on *Psalms*, for example, would unlock for the student more rhetorical tricks than he had ever dreamed of. No one knows how far this technique could be exploited because no one has yet attempted it on a massive enough scale.

What has been just outlined remains pretty much what the concept of machine teaching seems to hold for the teaching of English: an excellent way to drill students in mechanics and *explication de texte*. These considerations alone should recommend it to any member of the profession who has experienced the difficulty of driving students into a full expenditure of energy. Once again, however, the importance of programming lies not so much in the impact it can make on students as in the effect it can have on teachers. The state of mind induced by programming in encouraging a scientific view of subject matter places

the search for order in the materials themselves above personal whim and eccentricity. Teaching then becomes less a private than a professional matter. Programming, by joining teachers into a common search for the basic principles of subject matter, can demand a definition of goals which the teaching of English badly needs. Instead of relying on the judgment of individual teachers for a decision on what should constitute the curriculum at a given level of student growth, the success or failure of the program itself should furnish the answer. If out of 500 students, 450 can progress through 300 "frames" without difficulty, the assumption would seem to be that the course material is at least to that point realistically conceived. If all the students founder at, for example, frame 65, then the assumption must be that the material has not been properly sequenced. Programming in this way provides a yardstick for evaluating the syllabus.

The teacher of elementary courses in English who shapes curriculum from the order inherent in the subject rather than from personal whim has grown into a spiritual alliance with critic and scholar. Programming and machine teaching, once having imposed this scientific view on the profession, can even be abandoned. The really important thing is that the spirit of empiricism remain viable at all levels. To hold this uneasy empire in alliance, however, requires some kind of theoretical rationale. That design is already at hand in Professor Northrop Frye's *Anatomy of Criticism*. In cutting through the barriers now separating the different schools of critics, Professor Frye has shown that literary studies can be placed on an empirical basis, a step that strengthens rather than drains humanistic studies of their value. Frank acknowledgment that criticism is a science should frighten no one, except those who have used literary studies to exalt themselves rather than their subject matter.

Curiously enough the effort to place literary studies on an empirical basis has achieved greater momentum among Europeans than Americans.[3] Works like Leo Spitzer's *Linguistics and Literary History*, Erich Auerbach's *Mimesis*, and Ernst Curtius' *European Literature and the Latin Middle Ages* have provided—along with Professor Frye's book—a corpus of theory for a scientific method. The day is not far away when a periodic table of narrative elements will gather together the essential motifs of literary expression, just as the table of periodic elements in chemistry reveals the ultimate parts of any compound. From the intrigues of a Plautine servant to the meddling of a Vice in a Tudor interlude to the machinations of a Blifil in *Tom Jones* to the scheming of a Wickham in *Pride and Prejudice* to even the Moriarty of *On the Road* is not so great a distance as most people think. Literature imitates literature as well as life, and sometimes both. Characters, situations, motifs, modes of narration, being finite, are classifiable, an achievement which would constitute one step toward a twentieth-century "Apology for Poetry." If IBM cards can do the job more effectively than human beings, then we must be prepared to accept this fact. By moving in this, and similar, directions, the "stylicist" will do for the study of letters what the linguist has done for the study of syntax. "Stylistics" (call it whatever you like) could then become the physics of language and linguistics its chemistry.

Putting the case very well indeed, a *Time* magazine writer wrote recently that the only real limitation in machine teaching is "the programmer's ability to analyze precisely how to define and achieve mastery of a subject." The work of Professor Frye answers the first part of this demand by furnishing definition;

[3] "A Science of Literature?" *TLS* (Jan. 20, 1961), 40. The writer notes that over 2000 studies in stylistics have appeared on the continent of Europe, very few elsewhere.

the work of the programmers fills the second part of the requirement by outlining a plan for mastery of a subject matter. At present, however, the gap between Frye and the programmers is enormous. Frye's revelation of order in art would be as impossible to transfer to a machine as Einstein's revelation of order in nature. Furthermore it should go without saying that no one seriously considers applying the teaching machine to literary criticism or nuclear physics. Both these disciplines, however, can lend great status to the teachers who handle introductory courses. They should also support and underwrite programming of elementary courses which must look to them for a theoretical rationale, and even raw data. *The Anatomy of Criticism* in supplying a theory for imaginative literature raises the hope that an orderly analysis can also be achieved of functional prose. Once this ambition has been realized a teaching machine becomes useful.

The nexus between *Teaching Machines and Programmed Learning* and literary criticism of the stature of *The Anatomy of Criticism* lies then in a common commitment to an empirical method. Working from opposite directions, the technician of the teaching machine and the theoretician of literature may find themselves meeting somewhere in the center. Blocking this merger now is a failure both by public and by many teachers to see the order inherent in literature and its offshoots. Especially for this reason the programmer needs the support and experience of the subject-trained specialist, for left to its own devices the technology of machine teaching will remain disengaged from the total design of English studies. Technology without a science is futile, as witness the fate of so many "communications" courses. The programmer needs reminders that the heart of the humanistic experience lies in reading and writing, not in spoon-fed exercises. Reading and writing can be reenforced, however, with an orderly method for showing the essential principles behind literary expression.

From this accidental merger between programmer and critic may come at last a coherent undergraduate program in English, carefully sequenced from high school through the junior and senior years in college. Characteristically the "English major" consists of a course in Shakespeare, a survey of English literature, a creative writing course, a period course or two, perhaps in modern British fiction or the Victorian age. Fortunate indeed is the student who emerges from this grab-bag with anything more than a fragmentary conception of his discipline. Empirical studies based essentially, though not rigidly, on the "programming" concept may show that chronologically-oriented courses are the worst possible way to introduce a student to literature. Courses might better be arranged around genres, or the modes of comedy and tragedy, or the theory of prosody, or mythic archetypes. In this way literature could be adequately distinguished from history, sociology, politics, and philosophy—a step which would give the teacher of English the kind of identity he too often lacks in a public school system. His colleague in physics basks in the reflected glory of Einstein and Oppenheimer; the English teacher should be known as the man or woman who serves the same household gods as Frye and Curtius.

Automation and technology have already proved better servants than masters in several disciplines related to English. Collators have benefited from Professor Hinman's machine, concordance-makers have enlisted the help of Univac, image-collectors have punched IBM cards, and teachers of foreign languages have tripled the value of tape-recorder stock. At present the teaching machine would seem to have value only in freeing the lowest echelon of the profession from

sub-human toil. White-collar drudges, poring over stacks of wretched themes, will hardly inspire anyone with a respect for the humanities. On the other hand the scientific methodology, which can grow out of programming, enlists elementary school teacher and university professor under a single banner. The ancient, and fake, distinction between "scholar" and "teacher" will vanish with the recognition that neither title is worth very much without the other. From this new perspective a rapprochement could come about between educator and scholar, between public school and liberal arts college, between teacher and critic, and—best of all—between student and teacher.

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